REMARKS

Claims 1, 12, and 29 have been amended as indicated above. No new matter has been added.

Independent claims 1, 12 and 29 and their dependent claims stand rejected under 35 U.S.C. § 102(a) as being anticipated by "Checking Safety Properties Using Induction and a SAT-Solver" by M. Sheeran, S. Singh and G. Stålmarck. (hereinafter the "Sheeran" reference). The Applicant respectfully traverses this rejection.

Claim 1 has been amended to recite at least the following elements:

> (a) performing bounded verification on a circuit design for a number of transitions, the bounded verification corresponding to a predetermined limit for a number of transitions;
> (b) performing induction proof of a first property for the number of transitions, wherein the induction proof is performed by a process comprising the acts of:
> (c) if the at least one property is not verified, then increasing the limit for the bounded verification and repeating from (a).

It is respectfully submitted that the cited Sheeran reference fails to teach, disclose, or suggest this combination of claims elements.

Sheeran is directed to the problem of checking safety properties of large finite state machines using a SAT-solver. The Sheeran reference does not anticipate, teach or suggest that if induction proof of a property fails, then a predetermined limit for the bounded verification should be increased and the bounded verification and induction proof repeated as presently recited in claim 1. In fact, the Sheeran reference fails to make any mention, suggestion, or teaching of any increase in a limit of the bounded verification for any reason, much less an increase based failure to verify a property as recited in claim 1.

The Office Action cites to pages 111 and 112 of Sheeran and asserts that this section of Sheeran teaches that if the bounded verification and the induction proof are insufficient to determine the one or more properties of the circuit design to be verified, increasing the first number of transitions by increasing "i" (iterations) and finding the condition where state satisfy the property.

In fact, the general approach described on page 111 of Sheehan does not correspond to unbounded verification where the bounded verification corresponds to a predetermined limit for a number of transitions as is presently claimed.

As noted on page 111 at the beginning of section 2.2 entitled "Formulating the Problem", the symbol T is a transition relation on the set of states S, where Sheehan assumes that "the domain of T is the entire set of states S..." Sheehan is therefore describing an approach in which the process begins within an initial state, and then transitions through the states to prove the following:

$$\forall i. \forall s_0 \ldots s_i. \quad (I(s_0) \wedge path(s_{[0..i]}) \rightarrow P(s_i))$$

where i >= and the s_i "range over states."

There is absolutely no mention in this section of Sheehan regarding a predetermined limit for the number of transitions, nor that the limit is to be increased if at least one property is not verified.

The Examiner has noted that page 111 describes "performing the induction-based method of checking the property P by applying the transition relation T the number of times leading to the state S satisfying property P." However, that cited section of Sheehan does not describe that the specified set of states S is limited nor that the set S increases if a property is not verified. Instead, Sheehan is merely stating that within the specific set of states S, which is described as the entire set of states (as opposed to a bounded set for bounded verification), individual states will be viewed and the transition relation will be applied to find a state that satisfies P. However, transitioning of individual states within a set of states does not correspond to an increase in the limit for the set of states.

The Examiner has noted that page 112 of Sheehan discusses using a Bounded Model Checking approach. That discussion on page 112 is directed to using Bounded Model Checking to address formula (4) on page 111. However, this section of Sheehan does not in any way describe that the limit of bounded verification is to be increased if at least one property is not verified, nor that the prior cited limitations are to be repeated once such a limit has been increased. All that is stated in this section is the general statement that the cited Bounded Model Checking "reduces to a similar kind of iteration and satisfiability check" as described for handling formula (4).

Applicant notes that the discussion of bounded model checking on page 112 of Sheehan is specifically described within the document itself as being unsuitable for the general use in checking safety properties. Sheehan at page 112 (lines 13 to end) specifically states that this approach only holds for certain if the system is P-safe. In fact, the subsequent pseudocode and discussion is described as the "better strategy" as compared to the bounded model checking strategy. The subsequent pseudocode describes an approach in which a set of states is transitioned through to check if a system is P-safe. In the pseudocode, the "i" variable is merely a variable that corresponds to a set of states $s_{[0..i]}$ that is checked using a SAT-solver to determine if the system is P-safe. The variable "i" is incremented to transition through the set of states. There is no teaching that "i" is a limit of a bounded verification, much less that such a limit can be increased if there is a failure to verify a property.

For at least these reasons, it is respect fully submitted that claim 1 and its dependent claims are allowable over the cited references. For at least the same reasons, it is respectfully submitted that independent claims 12 and 29, and their dependent claims, are similarly allowable over the cited references.

In addition, amended claim 29 and its dependent claims teach "attempting bounded verification of one or more properties of a circuit design for at least a first predetermined number of transitions". The Sheeran reference does not anticipate, teach or suggest predetermined number of transitions. As noted above, Sheeran teaches using an exhaustive number of transitions to reach all states.

CONCLUSION

Based on the foregoing, all claims are believed allowable, and an allowance of the claims is respectfully requested. If the Examiner has any questions or comments, the Examiner is respectfully requested to contact the undersigned at the number listed below.

If the Commissioner determines that additional fees are due or that an excess fee has been paid, the Patent Office is authorized to debit or credit (respectively) Deposit Account No. **50-2518**, billing reference no. **7038392001**.

Respectfully submitted,
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